Earth and Space Science Instructional Materials Scoring Rubric

Gateway: The publisher must provide a Tennessee standards alignment guide as a part of the scope and sequence for the material. If this gateway is not met, the materials will not be scored. All Tennessee standards must be addressed within the material. If this is not met, the material will not pass review by the Tennessee Textbook and Instructional Materials Quality Commission.

Introduction:

The following Instructional Materials Scoring Rubric for Science is designed to score materials in the following categories:

- Instructional Focus
- Attending to Multiple Dimensions of Science Instruction
- Accessibility Features
- Alignment of Content

Scoring:

Each section is to be scored using a 0, 1, or 2. Use the following scoring guideline.

Tables 1-2:

- Adhere to the provided rubric statements for scoring.

Tables 3-4:

- 0: The standard is not present within the material.
- 1: The standard is present within the material. The intent and/or frequency component of the standard is not fully met.
- 2: A rating of 2 indicates the standard is present and all aspects of the standard are fully met.

Table 1: Instructional Focus					
Directions: **Adhere to the provided rubric statements for scoring.**					
Indicator	**0**	**1**	**2**	**Score**	**Evidence**
Central Phenomenon	Unit has **no phenomenon, or only a "hook"** to capture student interest at the beginning of the unit.	All units include one or more **smaller phenomenon or design challenge(s) and/or not all lessons connect to the phenomenon** or design challenge.	All units have a central phenomenon or design challenge that **develops throughout every lesson** of the unit.		
Activity Purpose	Material contains hands-on activities **do not serve** to grade-level scientific ideas	Hands-on activities **reinforce** scientific ideas aligned with grade-level standards.	All hands-on activities serve to **uncover** scientific ideas aligned with grade level standards.		
Use of Science Engineering Practices (SEPs)	Some units **do not provide students opportunities** to use the SEPs.	SEPs are present in all units, but **loosely or not connected to central phenomenon**.	In every unit, the **primary use** of the SEPs ties directly to explaining the central phenomenon or solving the design challenge.		
Student Engagement	**Neither of the given features** are present.	**One of the given features** is present.	Materials give students opportunities to: • expressly connect the DCI content from each lesson to		

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			relevant crosscutting concepts. • practice with the SEP that is relevant to that day's lesson.		
Concepts before vocabulary.	Materials **pre-teach vocabulary.**	In **some instances**, materials develop conceptual meaning first.	In **all instances**, materials provide experiences (e.g., investigations, data analysis, discussions) where students develop conceptual meaning of a scientific idea before introducing technical vocabulary.		
Connections across component ideas.	Materials **describe** connections for students, or connections are absent.	Some units include **standalone questions** in place of activities, where students communicate their understanding of connections between component ideas.	All units include **activities** where students communicate their understanding of connections between science ideas from *two or more component ideas* within the grade (e.g., LS1.A and LS2.C, ESS2.A and PS1.A).		
Connections across disciplines.	Materials **describe** connections for students,	Some units include **standalone questions** in place of activities, where	All units include activities where students communicate their		

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	or connections are absent.	students communicate their understanding of connections between component ideas.	understanding of connections between science ideas from *two or more disciplines* within the grade (e.g., LS and PS).		
Review opportunities	End of unit review is **not anchored to a phenomenon**.	End of unit review assesses learning of the **central phenomenon for the unit** only.	Materials provide opportunities for students to transfer new learning to **analogous phenomenon** in a review at the end of every unit.		
			Total		

Table 2: Attending to Multiple Dimensions of Science Learning

Directions:
Adhere to the provided rubric statements for scoring.

Indicator	0	1	2	Score	Evidence
Distribution of SEPs as required by the standards	Materials **do not include** a focal SEP for one or more units.	One or more SEPs are **disproportionately** featured as the focal SEP.	Materials identify one or more focal science and engineering practices (SEPs) for every unit(s) with a **balanced** distribution of all SEPs as a focal SEP throughout the units.		

Table 2: Attending to Multiple Dimensions of Science Learning

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Support for a focal SEP	**No** student facing or teacher facing supports for the SEPs.	Relevant **support strategies are absent** from teacher materials.	Every unit contains a focal SEP is featured in **student-facing materials and teacher materials** including instructional strategies for the particular unit and focal SEP.		
Connections across to crosscutting concepts as required by the standards.	Materials **describe connections with CCCs** or do not specifically address CCCs.	In every unit students make connection between the CCCs and **either** the SEPs or DCIs.	In every unit, students make connections between the crosscutting concepts (CCCs) and **both** the SEPs and disciplinary core ideas (DCIs).		
Developing crosscutting concepts (CCCs)	Materials **provide examples** of other instances of the CCCs or CCCs absent.	Students make connections between CCCs and **content not addressed in other units.**	In every unit, the materials lead students to **make connections between the CCCs in that unit and appearances of the CCCs in other units**.		
			Total		

Table 3: Accessibility Features				
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Digital Materials	**0**	**1**	**2**	**Evidence**
All lessons within the materials are available in digital form and include a printable option.				
In every lesson, materials include recommended supports, accommodations, and modifications for Students with Disabilities and English language learners that will support their regular and active participation in accessing on grade level material (e.g., modifying vocabulary words within word problems, sentence starters, etc.).				
			Total	

Table 4: Alignment of Content				
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Conceptual Understanding: The materials support the intentional development of students' conceptual understanding of key science ideas, practice, and concepts.	**0**	**1**	**2**	**Evidence**
ESS.ESS1.1) Construct an explanation regarding the rapid expansion of the universe based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.				
ESS.ESS1.2) Construct a model using astronomical distances to explain the spatial relationships and physical interactions among planetary systems,				

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stars, multiple-star systems, star clusters, galaxies, and galactic groups in the universe.				
ESS.ESS1.3) Analyze and interpret data about the mass of a star to predict its composition, luminosity, and temperature across its life cycle, including an explanation for how and why it undergoes changes at each stage.				
ESS.ESS1.4) Communicate scientific ideas to explain the nuclear fusion process and how elements with an atomic number greater than helium have been formed in stars, supernova explosions, or exposure to cosmic rays.				
ESS.ESS1.5) Analyze and compare image data from instruments used to study deep space (e.g., visible, infrared, radio, refracting and reflecting telescopes, and spectrophotometer). Evaluate the strengths and weaknesses of the instrumentation.				
ESS.ESS1.6) Recognize how advances in deep space research instrumentation over the last 30 years have led to new understandings of Earth's place in the universe and how these advances have benefitted society.				
ESS.ESS1.7) Analyze and interpret data to compare, contrast, and explain the characteristics of objects in the solar system including the sun, planets and their satellites, planetoids, asteroids, and comets. Characteristics include: mass, gravitational attraction, diameter, and composition.				
ESS.ESS1.8) Use mathematical or computational representations to predict motions of the various kinds of objects in our solar system,				

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including planets, satellites, comets, and asteroids, and the influence of gravity, inertia, and collisions on these motions.				
ESS.ESS1.9) Evaluate the evidence for the role of gravitational force and heat production in theories about the origin and formation of Earth. Design a research study to confirm or refute one aspect of such evidence.				
ESS.ESS1.10) Summarize available sources of data within the solar system which provide clues about Earth's formation. Using engineering principles, design a means to gather more data.				
ESS.ESS2.1) Given an environmental disaster, analyze its effect upon the geosphere, hydrosphere, atmosphere, and/or biosphere, including sphere-to-sphere interactions. Analysis should conclude with an identification of future research to improve our ability to predict such interactions.				
ESS.ESS2.2) Construct an argument based on evidence about how global and regional climate is impacted by interactions among the Sun's energy output, tectonic events, ocean circulation, vegetation, and human activities. The argument should include discussion of a variety of time scales from sudden (volcanic ash clouds) to intermediate (ice ages) to long-term tectonic cycles.				
ESS.ESS2.3) Communicate scientific and technical information to explain how evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle, and crust.				

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ESS.ESS2.4) Analyze surface features of Earth and identify and explain the geologic processes responsible for their formation.				
ESS.ESS2.5) Develop a visual model to illustrate the formation and reformation of rocks over time including processes such as weathering, sedimentation, and plate movement. The model should include a comparison of the physical properties of various rock types, common rock-forming minerals, and continental rocks versus the oceanic crust.				
ESS.ESS2.6) Make and defend a claim based on evidence to describe the formation and on-going availability of mined resources such as phosphorous, platinum, rare minerals, rare earth elements, and/or fossil fuels.				
ESS.ESS2.7) Apply scientific principles regarding thermal convection and gravitational movement of dense materials to predict the outcomes of continued development and movement of lithospheric plates from their growing margins at a divergent boundary (mid-ocean ridge) to their destructive margin at a convergent boundary (subduction zone).				
ESS.ESS2.8) Using maps and numerical data, evaluate the claims, evidence, and reasoning that forces due to plate tectonics cause earthquake activity, volcanic eruptions, and mountain building.				
ESS.ESS2.9) Design a research study to examine an area of increasing seismic or volcanic activity and predict what will occur in that area over the next month, year, and decade. The description should include the instruments and measures to be used in the study and an explanation of their capabilities and limitations.				

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ESS.ESS2.10) Construct a model which shows the interactions between processes of the hydrologic cycle and the greenhouse effect.				
ESS.ESS2.11) Obtain, evaluate, and communicate information about human or natural threats to Tennessee.				
ESS.ESS2.12) Engage in an argument from evidence to explain the degree to which the dynamics of oceanic currents could contribute to at least one aspect of climate change.				
ESS.ESS2.13) Use a model to predict how variations in the flow of energy through radiation, conduction, and convection into and out of Earth's systems could contribute to global atmospheric processes and climactic effects.				
ESS.ESS2.14) Using data, weather maps, and other scientific tools, predict weather conditions from an analysis of the movement of air masses, high and low pressure systems, and frontal boundaries.				
ESS.ESS2.15) Use satellite-based image datasets to compare and explain how weather and climate patterns at various latitudes, elevations, and proximities to water and ocean currents are a function of heat, evaporation, condensation, and rotation of the planet. The comparison should also include an examination of the same location across various seasons or years.				
ESS.ESS2.16) Design a mathematical model of Earth's energy budget showing how the electromagnetic radiation from the sun is reflected, absorbed, stored, redistributed among the atmosphere, ocean, and land				

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systems, and reradiated back into space. The model should provide a means to predict how changes in greenhouse gases could affect Earth's temperatures.				
ESS.ESS2.17) Analyze the multiple sources of energy that provide power in the state of Tennessee and compare them to each other and to an alternative energy source. The analysis should include their functional components (such as infrastructure cost, on-going costs, safety, and reliability), and their social, cultural, and environmental impacts (including emissions of greenhouse gases).				
ESS.ESS2.18) Identify the organisms that are major drivers in the global carbon cycle and trace how greenhouse gases are continually moved through the carbon reservoirs and fluxes represented by the ocean, land, life, and atmosphere.				
ESS.ESS3.1) Identify a geographical region or small area where energy and mineral resources are scarce and evaluate competing design solutions for developing, managing, and utilizing these energy and mineral resources based on a cost-benefit analysis.				
ESS.ESS3.2) Obtain, evaluate, and communicate information on how natural resource availability, natural hazard occurrences, and climatic changes impact individuals and society.				
ESS.ESS3.3) Design, evaluate, or refine a technological solution that reduces impacts of human activities on natural systems.				

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ESS.ESS3.4) Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.				
Total				